Crystalline Silica*

What is crystalline silica?

Crystalline silica is a basic component of soil, sand, granite, and many other minerals. Quartz is the most common form of crystalline silica. Cristobalite and trydimite are two other forms of crystalline silica. All three forms may become respirable-sized particles when workers chip, cut, drill, or grind objects that contain crystalline silica.

What are the hazards of crystalline silica?

Silica exposure remains a serious threat to nearly two million U.S. workers, including more than 100,000 workers at high-risk jobs, such as abrasive blasting, foundry work, stonecutting, rock drilling, quarry work, and tunneling. Crystalline silica has been classified as a human lung carcinogen. Additionally, breathing crystalline silica dust can cause **silicosis,** which in severe cases can be disabling, or even fatal. The respirable silica dust enters the lungs and causes the formation of scar tissue, thus reducing the lungs' ability to expand to take in oxygen. There's no cure for silicosis. Since silicosis affects lung function, it makes one more susceptible to lung infections like tuberculosis. In addition, smoking causes lung damage and adds to the damage caused by breathing silica dust.

What are the symptoms of silicosis?

Silicosis is classified into three types: chronic/classic, accelerated, and acute.

- **Chronic/classic silicosis,** the most common type, occurs after 10-20 years of moderate to low exposures to respirable crystalline silica. Symptoms associated with chronic silicosis may or may not be obvious; therefore, workers need to have a chest X-ray to determine if there's lung damage. As the disease progresses, the worker may experience shortness of breath when exercising and have clinical signs for poor oxygen/carbon dioxide exchange. In the later stages, the worker may experience fatigue, extreme shortness of breath, chest pain, or respiratory failure.
- **Accelerated silicosis** can occur after 5-10 years of high exposures to respirable crystalline silica. Symptoms include severe shortness in breath, weakness, and weight loss. The onset of symptoms takes longer than in acute silicosis.
- **Acute silicosis** occurs after a few months or as long as two years following exposures to extremely high concentrations of respirable crystalline silica. Symptoms of acute silicosis include severe disabling shortness of breath, weakness, and weight loss, which often lead to death.

Exposure limits

- OSHA Action level: 25 $\mu g/m^3$, calculated as an 8-hour TWA
- OSHA Permissible Exposure Level: 50 $\mu g/m^3$, calculated as an 8-hour TWA.

*Source material taken from www.osha.gov

Uses of Silica

- Abrasive (sand blasting) and polishing agents
- Extenders in paint, wood fillers, rubber, plastics, and soaps
- Molding agents in foundries
- Raw materials in cement, brick, tile, glass, etc.

Silica Dust Exposures in Construction

- Chipping, hammering, and drilling of rock
- Crushing, loading, hauling, and dumping of rock
- Sawing, drilling, grinding, chipping of concrete or masonry
- Demolishing concrete and masonry

Recognition of Silica Exposures

- Materials made of concrete or cement
- Rocks, stone, or sand
- Ceramics, clays
- Operations that create dust
- Dust control measures
- Personal protective equipment

OSHA Sampling % Greater than PEL

- Tuck pointing – 74%
- Sandblasting – 57%
- Jackhammering –29%
- Concrete cutting – 50%
- Lateral drilling – 44%
- Vermeer sawing – 33%
- Block sawing – 33%

Cutting Wet vs. Dry Methods

(% of sample above PEL)

Operation	Dry	Wet
Concrete cutting	50%	0%
Block sawing	33%	12%

OSHA HEAVY CONSTRUCTION SILICA DUST SUMMARY

Operation	#Samples	Likely Exposure
Jackhammer dry	17	at PEL
Concrete saw dry	4	>PEL
Concrete saw wet	4	<PEL
Lateral drill	9	>PEL
Bob cat concrete	1	<PEL
Shovel concrete	4	<PEL

Silica Controls

- Enclose/isolate operations.
- Use local exhaust ventilation.
- Use wet processes.
- Substitute silica with less hazardous substitutes when sandblasting (aluminum oxide, steel shot, walnut shells, plastic media, etc.)
- Use respirator protection (N95 disposable dust mask, ½ mask dual cartridge).
- Tool speed
- Interior vs. exterior work
- Wind direction/weather conditions
- If possible, change into disposable or washable work cloths at the job site, shower (where available) after the work is completed and change into clean clothing before leaving the job site.
- Don't eat, drink, use tobacco products, or apply cosmetics in areas where there is dust containing crystalline silica.
- Wash hands and face before eating, drinking, smoking, or applying cosmetics outside of the exposed area.

WETTING--MOST IMPORTANT CONTROL!!!

IF WORK ACTIVITY IS DUSTY, WEAR A DUST MASK!!!!

THERE'S NO CURE FOR SILICOSIS! PREVENTION IS THE ONLY ANSWER.